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A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. L
No. 1281

SATURDAY, JANUARY 15, 1944
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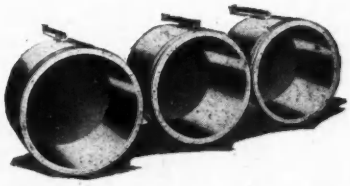

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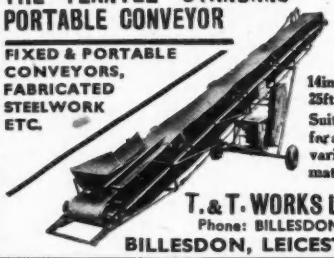

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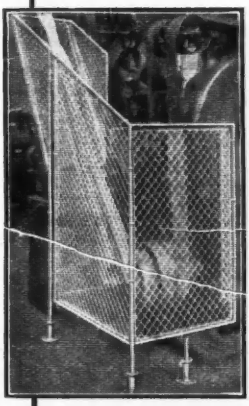

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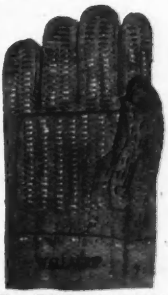

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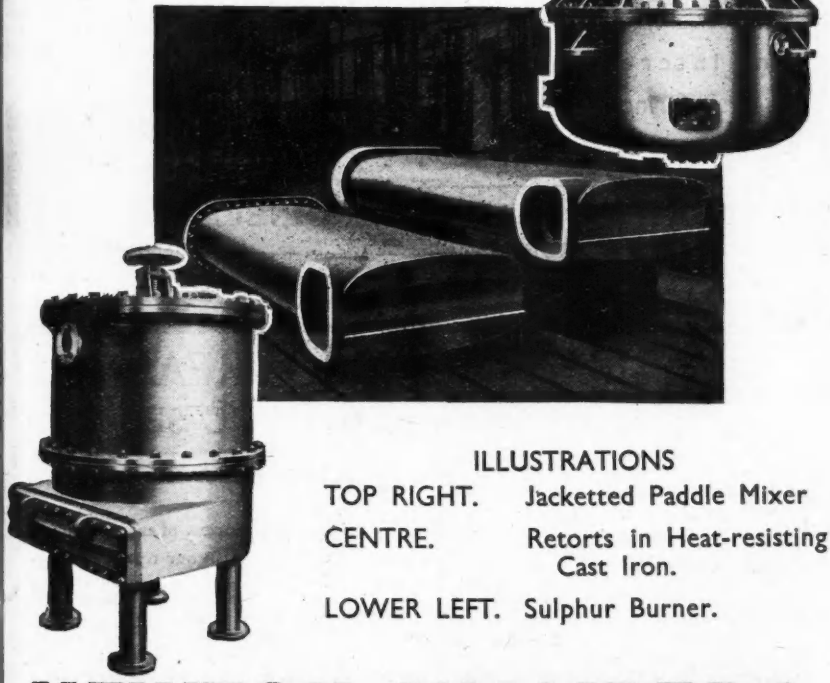

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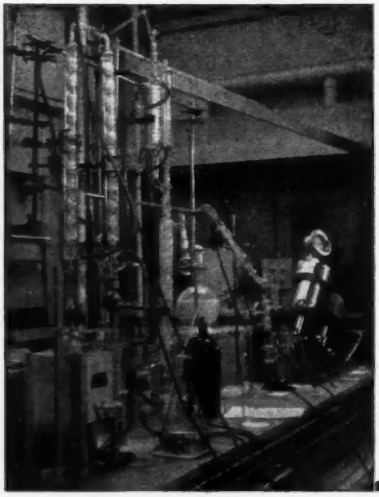

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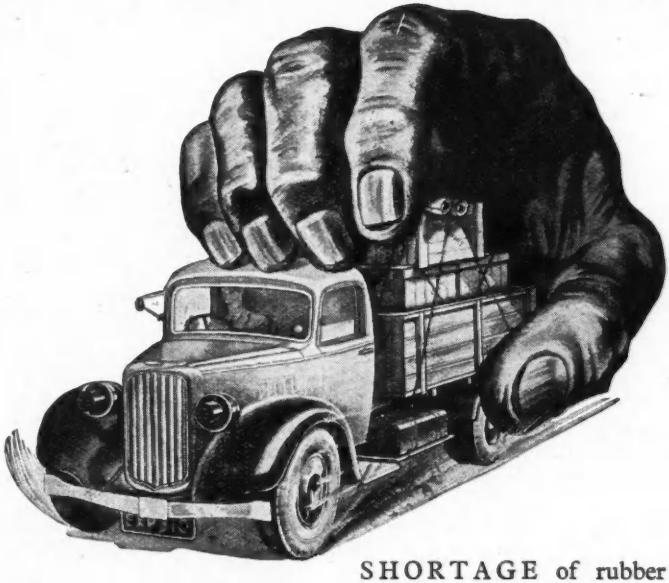

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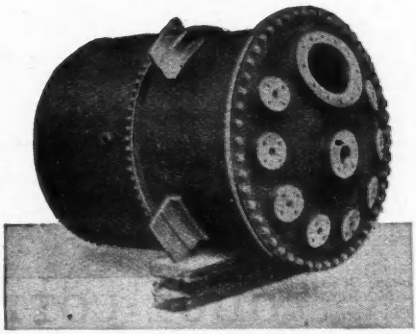

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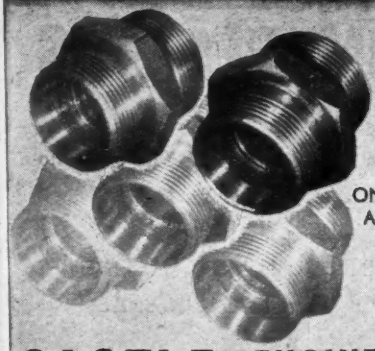

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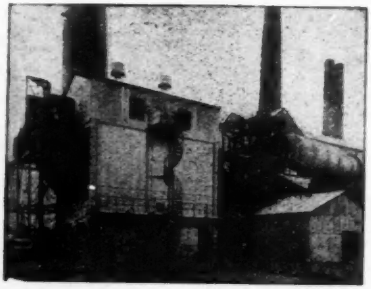

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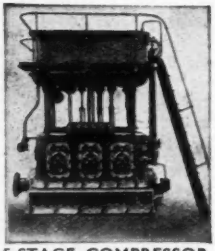

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VOL. L
No. 1281

January 15, 1944

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Lifting the Veil

IT is fairly obvious, to-day, that the attention of business men and politicians alike is keenly focussed on the problems of trade after the war—in so far as the major preoccupations of war permit—and that the subject of industrial policy is exercising their mind very greatly. The uncertainty of official policy, an uncertainty so great that one may almost speak of a lack of official policy, is preventing manufacturers from making plans ahead. The world is so ordered and governed that all must live by the product of labour. Some few fortunate people happen to possess so much capital that they need not work themselves, and a smaller number of these people are so unfortunate as to be unable or unwilling to work themselves, and can allow their capital to employ others to work for them. But the whole world is bound by unbreakable chains to the industrial chariot, and upon the progress of that chariot depends the material existence of everyone. There can be few subjects so important, therefore, as the method by which industry is to operate, and the achievement of good results is a matter of the very first importance to employers and labour alike. Employers and labour are but the officers and rank and file in the labour force; united they stand, divided they fall. The objectives of post-war industry have been briefly summarised as: (1) operation with the maximum efficiency, an essential if we are to hold our own against our competitors; (2) the best possible conditions for all engaged in industry; and (3) a reasonable return on capital.

Before we can make more than tentative plans for the change-over from war to peace production, there are certain things that must be answered. We want to know to what extent industry is to be controlled by the State. What controls will be imposed as a permanent feature? What raw materials will be available? What price controls will be maintained on the raw materials and on finished goods? The nation's export trade is, of course, vital to the maintenance of any decent standard of living. Industry can get no indication of the Government's plans. Probably it is necessary to hammer out some form of agreement with our Allies—or to discover beyond doubt that no such agreement is possible—before an export policy can be announced. It is time something of the sort was ascertained, however, for industry

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badly wants to know whether our export trade will be controlled by the Government, how far the Government will give serious help and how far each industry and each firm must rely on itself. The State-subsidised export trade of Germany and other nations proved a serious handicap until it was controlled by international cartels; how far will international cartels and arrangements generally be permitted in the post-war world? The recent indictment of I.C.I. and Du Pont de Nemours, whereby the U.S.A. Courts are asked to break up an international combination that is alleged to be contrary to the Anti-Trust Laws, gives us "furiously to think."

It is useless and a waste of time to debate academic questions of public *versus* private ownership, and all the rest of the political hocus pocus, if the basic questions are not answered quickly and clearly. It is well, then, that the political parties are examining their respective positions and are setting forth their ideas. The Conservative Central Committee on Post-War Problems has lately published its findings and with these we do not think there will be much serious disagreement. The Report declares that there must be a new awakening to technical progress, more trained scientists, a stronger development of scientific research, and a far greater scope for scientists. There must be no heavy unemployment, but neither must there be any slackness in high or low places, in the board-room or at the bench. Cheap credit and heavy expenditure on public works are not regarded as being more than a buffer against depression; they can neither cure it nor prevent it. With proper handling of the situation on demobilisation, there should be plenty of jobs for some years ahead; the danger will come later when the peak demand consequent upon reconstruction has passed. Our position as a great trading nation makes us "more exposed to ups and downs than a self-contained country to which foreign commerce is proportionately less important." The most important concrete suggestion put forward in this report is for the public promotion of "the bulk purchase of universally desirable household goods" of a wide range, so that bulk production can be maintained during periods of low demand, thereby tending to lower costs and prices and encouraging consumption as well as employment. The Report displays a welcome grasp of the essential fact that the success of any employment scheme or policy depends upon its two-fold capacity (a) to produce work, and (b) to produce services or goods which contribute ultimately to the communal well-being—a condition too often forgotten.

Where does all this lead us? Out of this welter of ideas, can we discern the emergence of concrete policies? In answer to this we would draw attention to a leading article in *The Times* discussing this self-same report. It is held that the Report "is far more remarkable for the wide area of common ground which it establishes with other recent pronouncements on the same subject than for any points of divergence due to insistence on party doctrine. It is not too early to speak of agreement among all parties on certain broad principles of a programme for industry, though differences may still be revealed about the methods of their application. Among these principles are the need for a nation-wide expansion of education and especially technical education; the need for a greater development of scientific research and for a prompter application of its fruits to industry; the need for improved industrial conditions and especially for more ample provision for trained labour management; the need for permanent and continuous control of the future location of industry; and the need for 'a practical system of co-operation between the Government and industry' based on a larger measure than hitherto of mutual understanding, and requiring a new kind of civil service or at any rate a new kind of training for civil servants concerned with the relations of State and industry."

These principles are likely to receive general approval though the details may be subject to discussion. The need for a permanent and continuous control of the future location of industry, for example, is not altogether clear. Industry generally finds the best location for itself, and interference with this may well lead to increased costs and other difficulties. In general, however, we are beginning to lift the veil over so little and to see something of the shape of things to come.

NOTES AND COMMENTS

Reviewing Chemistry

MORE than ever this year have we felt the heavy weight of the Paper Controller's hand. To review a year's progress in the chemical industry with the amount of paper available for a single issue of THE CHEMICAL AGE has proved an impossible task, so varied and so copious is the material that must be dealt with. We would therefore ask our readers' pardon if certain articles of general application to the whole of the past year were inevitably crowded out of what was officially described as the "Annual Review" number. Although we have been flattering ourselves, perhaps unjustly, that the types of chemical industry dealt with in our last week's issue covered a fairly wide field, the whole extent of that field is still far from having been examined. This week, for example, we are publishing Couzens and Yarsley's masterly review of progress in plastics; and we actually heaved a sigh of relief when we found that, for "security" reasons, a good deal of material on that subject had had to be omitted. Frankly, anything that aids us, in these hard times, in our hardly congenial task of getting a quart into a pint pot, is welcome. We look forward always, with a faint, a very faint, hope, to the day when the supply authorities may acknowledge the usefulness of trade and technical journals (which they have admitted, and *on paper,* too), by giving them a slight extra allowance of space to print on.

More about Cartels

A CONSIDERABLE flutter has been caused in the lay Press by the announcement of the U.S. Government's indictment of I.C.I. and Du Pont de Nemours (among other defendants) for having violated the Sherman Anti-Trust Act. Lord McGowan and Lord Melchett, of I.C.I., Mr. Lamont Du Pont, chairman of Du Pont's, and Mr. W. S. Carpenter, president of the Remington Arms Company, are personally named among the accused. To have the names of two British peers on the charge-sheet doubtless adds considerable spice to the affair, but when one comes down to brass tacks and examines the indictment in detail, it is quickly seen that there is nothing very new or exciting to record. It is, in fact, a question of whether or not it is a good thing to have cartels. The U.S. Assistant Attorney-General has described his Government's action as " a major blow at the cartel system," and alleged that the system had "plagued us with a shortage of critical materials and industrial skills during the war, and unemployment and idle plants during peace." Well, that is one point of view, and one which would be subscribed to by the Scottish youths who exploded a cordite charge against the front door of the I.C.I.'s Glasgow office. Lord McGowan, however, thinks otherwise, as might be expected. In a statement to the Press he has pointed out that I.C.I. (or its predecessor companies) has had a working agreement with Du Pont's for 40 years, and such policy of co-operation (which he describes in some detail) he claims to have been of benefit to both Britain and the United States; he further insists that without some such scheme of international co-operation in industry, the post-war period is likely to be chaotic rather than orderly.

The Safeguard of Publicity

OBVIOUSLY, there is a lot to be said on both sides, and the issue is far from being clear-cut. A great deal hinges on whether the controllers of a cartel or a monopoly can be trusted. Some, no doubt, can; others, quite certainly, cannot, as we have learnt to our cost in the past. It seems to us that there is a simple safeguard which can be applied, in order that the peoples of the world as a whole can derive due advantage from the orderliness that the cartel system undoubtedly brings to industrial operations. We make no claim to originality in this suggestion—it has emanated already from many quarters, including, most recently, the Report on the Future of British Industry, made by the Conservative Party's sub-committee on industry. This is, simply, that all cartel agreements should be given full publicity, and that they should be registered with the appropriate Government department. Secret agreements involving the control of prices and of competi-

tion are anathema, and it appears to us that the U.S. Attorney-General's main task is to demonstrate how much of the alleged cartel's business was carried on *sub rosa*. Lord McGowan has stated openly that his company is willing to register, in the proper place, all arrangements of the kind which it has made or will make. When the fanfare of trumpets, which inevitably heralds the announcement of such a case in America, has died down, we shall be interested to see how much substance there is in the charges that have been levelled at the chemical industry.

Science without Tears

IT may be a fault of our sense of humour, but facetiousness is a quality which we abominate. Particularising further, we would stigmatise especially that form of facetiousness which consists in poking arch fun at scientific knowledge, and which can be studied in its most virulent form in certain British instructional films for exhibition to the general public. A salutary, and at the same time ingenuous, rebuke to this particular form of asininity was administered recently (according to the Moscow correspondent of *The Times*) by a certain Russian audience—somewhat self-consciously described as "a representative group of Soviet workers" —to whom a number of British instructional films had been presented. With native courtesy, they received the films well, it is said, but expressed "bewilderment at the peculiarly facetious style of the commentary." Let us piously hope that they were satisfied with the explanation offered, that "in the opinion of British film distributors the public are unable to appreciate science unless it is sugared with light badinage." We are not sure whether that indictment damns more utterly the film distributors or the British public, but it will take a lot of living down on the part of somebody. We here address an appeal to the new Scientific Film Association: will they please hurry up and produce some films, suitable for export, which will help to correct the false impression that must be floating around? We hear that they have in hand a film about penicillin production; let them get it through quickly before we all have a jolly good laugh about mouldy cheese, what?

More Abrasives

NOT being in the confidence of the Ministry of Supply, we are not qualified to state the exact position of abrasives in this country to-day; but, in the recently-published Supplement No. 2 of the *Raw Materials Guide*, we detected no reference to any change in the position concerning pumice. The original terms of the Abrasives Control presumably, therefore, still hold good: "Pumice powder is not imported, and lump pumice is imported under licence only for special purposes." It is no secret that the demand for good quality abrasives in this country is at present greater than the supply; and, in view of the recent changes in the strategic situation in the Central Mediterranean, it seems not unfair to suggest that something might be done towards bringing home some of the very excellent abrasive that is the staple product of the Lipari Islands, not far off the Sicilian mainland. Admittedly, the first business of the Allied troops, on capturing those islands, was the release of the prisoners of fascist tyranny who had been incarcerated there. But, that done, let us take advantage of the natural wealth of the liberated lands. Shipping should present few difficulties; pumice is a light-weight product, and a little goes a long way; and we cannot believe that the holds of all homeward-bound vessels from the Mediterranean are fully committed to military needs. Even so, a product much needed in munition factories could surely be counted as a military object; and there might be just a trifle over for non-priority distribution. Two other points occur that might have weight in the matter: the cheapness of pumice, and the low risk of silicosis from its dust.

Tests conducted at the United States National Bureau of Standards indicate that solutions of iron salts can be substituted for chromium salts in tanning leather, but that the resulting product will probably show less resistance to aging. Iron salts had been shown by previous studies to offer some promise as successful tanning agents, and results indicate that ferric sulphate may be used, provided that certain organic acids are added to the tanning solutions to stabilise them. Lactic, citric, glycollic, and gluconic acids were found suitable for this purpose.

Mr. E. G. Couzens

PLASTICS: A Review of Progress in 1943

by

E. G. COUZENS, B.Sc., A.R.C.S., and V. E. YARSLEY, D.Sc., M.Sc., F.I.C.

Dr. V. E. Yarsley

THE year 1943 has been in many ways a significant one for the plastics industries. Plastics are being used to the fullest possible extent in the war effort of the United Nations, but their developments, and the influence they are likely to exert on post-war industry, cannot yet be described, for the censorship which clamped down tightly on the British industry at the beginning of the war, has made it exceedingly difficult to record technical progress here except in the most general terms. This rigorous secrecy compares unfavourably with the relative freedom accorded in America. Many of the citations in this review are thus necessarily of American origin, but it can be assumed that similar progress has been made in this country. This handicap was particularly revealed recently[1] over the publicity given to the now well-known grenade No. 69, an ingenious moulded unit developed in this country but reported first in the American Press after it had been produced in Canada[2].

Quite apart from production achievements in materials, processes, and products, the year has been significant for the change that has taken place in the relation between plastics and the outside industries. After suffering for so many years as the result of both over-publicity and the wrong type of propaganda, there are indications that the industry not only has a more accurate "blue-print" for its future, but that this is appreciated in its true perspective by outside industries. Plastics are still unfortunately the centre for the speculative elements in industry, finance, and journalism, but here again, fortunately, there are indications that the heyday of speculation is past. Such a phase was inevitable in the development of a somewhat spectacular industry and it will be remembered that rayon, gramophone records, radio, and safety glass in turn went through the same phase. Thanks to the wise attitude adopted by the British plastics industry through the medium of its trade federation, it is probable that a more sober attitude will ultimately be adopted.

This process of stabilisation has been facilitated by the high-pressure exploitation of plastics due to shortage of other raw materials, which has forced the serious consideration of plastics on diverse industries and has led to the development of their use on their own merits at a rate which would never have been achieved under normal conditions. America has greatly helped by the generous application of "lend-lease" to plastic raw materials. With her immense natural resources, her mental attitude towards new technical developments and her late entry into the war, she has achieved enormous production of such plastics as polyvinyl chloride and polystyrene, and from this we have greatly benefited. On the other hand, this country, forced by shortage of metals, had led the way in the application of plastics in aviation and other war purposes; there has been a valuable exchange of information, as well as much publication in America of the later efforts in plastics exploitation. All this is helping to establish plastics in a true perspective. Another development particularly noticeable during the past year is the recognition by industry that plastics, while they have many unique properties, are best exploited in conjunction with other materials and are not to be viewed as substitutes chiefly of interest as cheap competitors with metals, woods, and ceramics[3].

Accurate assessment of the developments in plastics during the year has been rendered more difficult by the total absence of production statistics since the middle of 1942[4]. The last available figures showed the American production of synthetic resins in 1941 at 438,000,000 lb., an increase of 58 per cent. over 1940, while the production in some branches of the industry during the first four months of 1942 was almost double that in the corresponding period of 1941. Though no actual figures have been made public since then, there are indications that on both sides of the Atlantic the production has been very high. This brief review of the year's progress has been sub-divided for the sake of clarity in reference; beginning with raw materials, working through general considera-

tion of processes and design trends, and going on to advances made in specific branches of the industry. Standards and testing methods are separately considered, and finally some reference is made to new resins and research on structure.

Raw Materials

The main concern of the industry has been to obtain the essential raw materials to meet current demands, and in this it has been remarkably successful, having regard to the difficulties, natural, geographical, and due to enemy action. These difficulties have increased the search for indigenous raw materials, and have given rise on occasions to some warnings and plain speaking, such as the comments of Mr. Kenneth Chance earlier in the year[5] when he demanded a more vigorous exploitation of our raw materials, particularly coal. There are welcome signs that the possibilities of coal as a raw material for plastics will in the future receive more than the scant consideration accorded to it in the past[6], although there is much leeway to be made up. The possibilities of imported oil have also received consideration, and Tugendhat[7] has pointed out that distance from the oilfields need not be a serious handicap. Oil residues have received considerable attention during the year, especially as possible plasticisers for vinyl polymers in cable coverings. Strong support for the use of coal *versus* oil as a basic raw material for plastics was recently given, following the statement of Mr. Ickes that at the present rate of use, available oil supplies cannot be expected to last much longer than 14 years[8].

Among the most serious limitations of plastics hitherto has been their relatively low heat-resistance, the vulnerable carbon-to-carbon linkage being unable to withstand temperatures in excess of 180°C. Attempts to improve this property have frequently received publicity, but little commercial progress has been made. Considerable interest was therefore attached to the development of the methyl silicones, in which the silicon-to-carbon linkage gave an increased resistance to heat up to 260°C.[9]. These materials have been developed in America but are not yet available commercially in this country. Methacrylate plastics of increased heat resistance have also been reported[10]. These are used for the production of a variety of articles for war purposes.

Melamine-formaldehyde condensation products have steadily gained ground, but surprisingly enough there is no indication of bulk production yet in this country. The production and properties of these materials have been reviewed by Gams, Widmer and Fisch[11] and their possible rôle in war service has been outlined [12].

Considerable progress has been recorded in the manufacture and application of hydrocarbon polymer thermoplastics, although here again, apart from the acrylics and the ethylene polymers which were developed in this country and to which increased publicity has recently been given[13], there is still no definite information available on the production position. Among the extruded plastics, vinylidene chloride copolymers have attractive properties, but the developments in this field appear mainly limited to America[14]. The possibilities of thermoplastics as rubber substitutes in the coating of fabrics has been reviewed by Schildhauer[15]. Outstanding examples are "Saflex," a vinyl acetal made by Monsanto, the use of which in raincoats alone is estimated to save 17,500,000 lb. of rubber; and ethyl cellulose, which on account of its resistance to cold has found valuable applications, *e.g.*, for identity panels on army trucks. The group of polymeric thermoplastics known as nylon includes materials of widely differing physical properties, which have hitherto been mainly applied in the production of fine and coarse filaments. As plastics they are of comparatively recent development, but already great progress has been made in adapting the standard operations of extrusion, compression, and injection-moulding to the peculiar thermoplastic properties of the nylons. A special grade known as F.M.-1 has been developed for injection-moulding[16], but its commercial use so far is limited to a few special military applications. A very important feature of nylon is its high softening-point.

A thermoplastic material has been described which can be melted and cast without pressure, and it is claimed that it may increase aircraft production in specific cases by as much as 50 per cent.[17]. Known as "Thermocast," the new material will be used in making forming-blocks, dies, and jigs on which the metal parts of aircraft can be fabricated. The material has an ethyl cellulose base, and, though of a wax-like consistency, has a very high compressive strength. It can readily be reduced to a molten state at 200°C., and can be easily poured into a single mould. Further details of the nature and properties of the new material have recently been published[18], but it is possibly too early yet to evaluate its ultimate possibilities.

Processes

Among the process developments recorded during 1943, the application of high-frequency heating in the moulding and curing of plastics, picturesquely styled "neatronic moulding," is by far the most significant. Again, it may be said that it is too early to evaluate its ultimate commercial importance, but it is certainly the greatest advance in plastics technique since automatic injection. A point of great interest is the possibility that, by a very great reduction in the time-cycle of thermosetting moulding, it may enable these plastics to compete with the injection moulded thermoplastics. "Heatronic" moulding has reached commercial application and has naturally received much attention in technical circles and in the literature[19]. The advantages claimed for the new process are summarised by Meharg[19] as follows:—

(i) It makes possible the moulding of impact-

resistant phenolics as readily as general-purpose materials.

(ii) Moulding of thermosetting materials in ⅛ in. thickness and upwards can be accomplished in cycles equal to or shorter than those used for injection of thermoplastics.

(iii) Moulding pressures may be reduced by 30–40 per cent. on present standards and curing times by one-tenth to one-half present figures.

(iv) It makes possible for the first time the moulding of thermosetting sections greater than ⅜ in.

The mechanism of the process is simple: the energy is expended and the heating generated within the plastic to be moulded. Late information on the development of "heatronic" moulding and some of the newer applications of the process has recently become available in this country[20]. The use of radio-frequency for the seaming (sewing) of thermoplastics has also been described[21].

From the early days of plastics attempts have naturally been made to work the new materials as far as possible by the standard methods applied to metals and wood, and they have frequently been rated in accordance with the ease with which they would conform to such standards. Machining, drilling, and turning have in many instances proved relatively simple, and heat- and pressure-manipulation of thermoplastic sheet has followed easily. In this connection it is interesting to note the developments recorded in the moulding of c-stage phenolic laminates[22]. Metal technique has been pushed further in the direction of welding of thermoplastics[23], and advances have been recorded in the metal spray coating of plastics[24].

Though not a welding process in the accepted sense, but rather a cycle of pressure and heating applied to a thermosetting plastic bonding agent, the new "Cycleweld" process described by the Chrysler Corporation in America is of great interest[25]. The new process makes possible a permanent thermosetting plastic bonding for metal, wood ceramics, plastics, fibreboard, and rubber in any described combination, the bonding plastic being varied according to the nature of the sheets to be secured. According to J. G. Saunders, the inventor of Cycleweld, the new process will find post-war use in practically every type of structure where it is desired to get the utmost strength out of every pound of material. This is very similar to the "Redux" process developed in this country by Aero Research, Ltd.

Further progress has been made during the year in the low-pressure moulding of laminates, and details of some recent developments have been given by F. P. Wilson[26]. Progress made in the blowing of plastics, a process almost as old as the industry, has also been reviewed[27]

In one form or another, plastics are penetrating almost every branch of industry, so that it is becoming increasingly difficult year by year to present an adequate review of progress made. Added to this is the difficulty of war-time censorship, to which reference has already been made. As far as possible, developments in the major user industries will be dealt with.

Applications

In aircraft construction we have an industry which has always taken matters very much into its own hands, and has developed materials to meet its own requirements. Several useful reviews of the part played by plastics in aircraft production have appeared[28] and the more specific use in the production of the now well-known De Havilland "Mosquito" has received considerable publicity[29]. Following this, there is now no possible excuse for misunderstanding the rôle of plastics in aircraft building; what has so frequently been referred to as the plastic plane is, in point of fact, a plastic-bonded plywood plane[30]. Plastics also play an increasingly important part in the fitting of aircraft. Out of the use of transparent sheet for screens, and opaque sheet for fairings and light internal fittings, has grown a self-contained industry, the manipulation of thermoplastic sheet, which will be of no mean importance in post-war industry. Recent advances in the production of transparent enclosures have been reviewed by O. E. Brown[31]. C. Fell[32] has given a survey of aircraft applications of plastics, and their use in production of fittings for the "Thunderbolt" has also been described[33]. An interesting application of plastics was the use of a nylon tow-rope to bring the W.A.C.O. glider safely across the Atlantic last summer[34]. Another most important application of flexible plastics with a polyvinyl chloride or Formvar base is their use in bullet-proof tanks and petrol-pipes, but details of their use are not available.

Plastics have established themselves as essential to aircraft construction. It is now not so much a question of finding a suitable application for a plastic, as developing a specific plastic to meet a specific need. Although, as North pointed out some time ago, we have a long way to go in this direction[35], plastics have offered new possibilities to designers of aircraft, and have influenced current trends in design. How far these can be applied has been surveyed by H. R. Gordon[36]. Some of the applications of plastics to aircraft will no doubt be passed on to the motor-car industry. At present this industry is in battle-dress, and while there is little outward difference between a battle plane and a commercial craft there is all the difference in the world between a private car and its war-time counterpart, the armoured car or tank. As far as plastics and the automobile industry are concerned, therefore, we are dealing for the present with the shape of things to come[37].

In the electrical industry three plastics, now reaching the peak of their application, have made a most important contribution. The first two, polythene and polystyrene, characterised by very low power-factors, are invaluable in radio and radiolocation. The first, being

flexible, and readily moulded and welded, is unique in its application to H.F. cables and junctions, while the second, with an even lower power-factor, being rigid and easily injection-moulded, is absolutely essential as a structural dielectric in H.F. apparatus. Both are made in this country. The third, polyvinyl chloride, is now being used in place of rubber to the extent of many thousands of tons for cable covering, and the past year has seen an immense development in its application and in the study of its processing and properties.

Plastic bearings are extending their usefulness in heavy duty mills[38] and the shortage of lignum vitae has enabled plastics to get something more than a foothold in the construction of stern-tube marine bearings[39]. They obtained this opening in a crisis, but they will hold it on merit. An allied application is the use of plastics in the construction of gears. These, like the bearings, offer great resistance to corrosion and have solved many problems of lubrication in difficult locations[40]. Miscellaneous engineering applications of plastics described have included insulation[41], flush valves[42], plastic hinges[43], flexible pipes[44], and pumping machinery[45].

A novel engineering application reported during the year, and one capable of offering material assistance particularly in war-time, is the use of plastic in the salvage of porous castings[46]. Faulty castings are thoroughly cleaned and Bakelite sealing solution is then pumped into the interior at a pressure varying (according to the nature of the job) between 50 and 600 lb., so that the fluid penetrates all the pores and interstices. The casting is then subjected to controlled heat to "cure" the plastic, after which it can be subjected to applied pressures up to 8000 lb./sq. inch. It is claimed that in this way many castings which would otherwise have been scrap have been reclaimed for use. Progress has also been made in the quick curing of thermosetting anti-corrosive coatings for metals. The "Plasto-glaze" process has been described[47], which not only increases the corrosion-resistance of small marine craft, but also, it is claimed, materially raises their normal cruising speed.

Plastics in Building

The use of plastics in building has for some time past been a fertile ground for speculation, but welcome attempts have recently been made to present this side of the industry in its true perspective. H. H. Lusty[48] has given a well-balanced survey of the possibilities, and a warning note against over-optimism was sounded by Warnett Kennedy[49]. The place of plastics in structural engineering has also been reviewed[50], and R. V. Boughton[51] has considered the influence of specific gravity, a powerful argument in many ways for the use of plastics. The possibilities of plastics as replacements for metal in plumbing appear good in view of the possible lead shortage[52], and in this connection "Saran" tubing and related plastics may have a special part to play[53]. When plastics find their full application in building the houses of the future, it is probable that we may see radical changes in design to meet the new materials. Built-in furniture, also largely in plastic-bonded sheet, may be used to a much greater extent than in present-day homes. G. Fejer[54] has given a "British plan for furniture," while the possible influence of plastics on furniture of the future has also been considered[55].

Among other old-established industries which have for some years kept a keen eye on the possibilities of plastics, the printing industry has made further progress during the year. The light weight of plastic stereos, together with the ease with which they can be moulded from a Bakelite matrix by an absolutely standard process, has led to their extensive use, especially for foreign information and propaganda. Their "life" does not yet equal that of stereo metal, but their use abolishes the stereo foundry, and this may be a considerable advantage. Among the developments recorded, the most important is the use of both thermoplastic and thermo-setting materials for printing-plates of various types [56] [57].

Medicine and Surgery

The uses of plastics in medicine and surgery in this country are still far behind what might be expected. In isolated instances medical men have taken to plastics wholeheartedly, but the difficulty appears to be that the medical profession fails to realise what plastics can offer, while the industry does not know what the profession requires. It is reassuring, therefore, to see increased reference to the possible increased use of plastics in saving life, at a time when its major rôle must be in helping to destroy it. E. F. Lougee[58] has reviewed the possible supplementing of facial surgery with vinyls, and the use of plastics in place of metal in surgery has also been considered[59] [60]. An expendable hypodermic syringe in plastic has also been described[61], as have the use of transparent plastics in the treatment of arthritis[62] and for contact lenses[64]. As regards dental applications, the swing from rubber at the end of 1942 brought the acrylate dentures into monopoly of the field. There is room for considerable development, and the possibilities of vinyl copolymer dentures have been considered by A. W. Browne[63].

The war has naturally claimed the major attention in the application of plastics, both in new applications impossible in conventional materials, and in conserving supplies of metals, wood, etc. Most of these applications are still on the secret list, but some have been made public during the year. Among the most interesting are the following: the No. 69 hand grenade[65], the Navy training bayonet[66], and the plastic W.D. helmet[67]. The possibilities of plastics in ordnance have also been surveyed[68], while H. McCann[69] has reviewed Canada's war-time plastics programme. A development of significance to many departments in war-time is the use of plastic materials in producing sub-

stitutes for Kapok, so vital in many life-saving devices for the Navy and Air Force[70].

Among the miscellaneous industrial applications of plastics the following are of special interest: beer pipes[71], nylon bristles[72], tyre casings of plastic cord[73], gasket material[74] and uses in the leather industry[75].

Testing

Outstanding in this department is the collection of tests published by the A.S.T.M. and sponsored by their committee D.20[76]. This contains 13 specifications for materials, covering most of the well-known plastic compositions, followed by an exhaustive list of physical tests to which reference is made in the main specifications. Many of the specifications and tests are tentative, but they constitute the most complete effort to date to devise methods of standardising the industrial plastics. In this country much work is being done on the physical properties, especially at low temperatures, of the polyvinyl chloride compounds used for cable covering. This work is not published, but is communicated to all makers and users of the compositions, and is of great importance in view of the replacement of rubber by P.V.C.

The most marked development of new tests has been in the direction of fatigue-resistance and similar dynamic properties. A fatigue test for cellulose acetate plastics is described by Findlay[77], for flexible vinyl copolymer and butyral by Duncan and Fliggor[78]. Much attention has been paid also to low-temperature behaviour (mentioned already in the case of polyvinyl chloride), this work being necessitated mainly by aircraft and military requirements. Oberg and others of the U.S. Army Air Force[79] give extensive data for the mechanical properties of plastics at normal and sub-normal temperatures.

An extensive programme of work is being carried out at Teddington on the physical properties of different kinds of laminated materials, the effect of different resin contents, and the methods of testing the products. This work has been exhaustively summarised by S. L. Smith[80] with particular regard to structural uses. Although the paper describes work done over a period of some years, it is an outstanding event of 1943, in that no such authoritative review of the properties of laminated materials has been published before. Further evidence of the interest in physical testing is provided by Telfair and Nason's improved method of impact testing[81] and by special tests which have been devised for "mar resistance" and "slenderness"[82]

Chemistry and Structure

Little information is available on research in new synthetic resins, though much work is being done. In America, d'Alelio and his colleagues of the G.E.C. are developing a new group of condensates based on melamine and patented by British Thomson Houston in this country. Their methods involve substitution, often by long and complex chains, in the diazine or triazine ring, and their aim is the production of self-curing materials of good mechanical properties and water-resistance.

Much has been heard of the new American glass-clear resins C.R.39[83] and the like. These are low-pressure thermosetting resins said to be based on allyl alcohol from petroleum products, and are used for casting sheet similar to "Perspex," and also for lamination. They are said to be harder than methyl methacrylate, but not hard enough to replace glass. Other resins are "Paracon"[84], a polyester rubber, made by Bell Telephone Co. by condensation of dibasic acids with glycols, and "Polectron," produced by the General Aniline and Film Co. as a mica substitute; this may be similar to the German "Luvican," a polyvinyl carbazole, which is characterised by a very high softening-point. No published details are however available.

The structure of plastics and its relation to physical behaviour has received a great deal of attention, following the Faraday Society's symposium in 1942. A substantial clarification of this complex subject has taken place, thanks to papers by Baker and Fuller[85] on intermolecular forces and chain configuration in linear polymers; by Whinfield[86] on molecular structure and fibre formation; by Bunn[87] on the stereochemistry of chain polymers; by Tuckett[88] on the significance of softening point tests; by Simha[89] on anomalies of plastic flow and their interpretation; by Tuckett[90] on the softening of thermoplastic polymers; and by Turner[91] on the structure and physical properties of plastics. Mention should also be made of an outstanding book on the chemistry of large molecules, edited by R. E. Burk and O. Grummitt[92], which brings up to date and summarises the existing state of knowledge of the chemistry, the structure, and the colloidal, elastic, and electric behaviour of the high polymers, whether synthetic or cellulosic, on which the plastics industry is based.

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"War" Against I.C.I.

Scottish Youths and a Cordite Charge

THREE Scottish youths, aged 15-16, have just completed a private war against I.C.I., Ltd., and received 14 days in a remand home to recover from their experiences. This sentence was passed by Sheriff Kermack in Glasgow Sheriff Court on January 4, when the three lads pleaded guilty, through an agent, to having placed a tin containing 5 lb. of cordite at the door of the I.C.I. offices in Blythswood Square, Glasgow, on December 24, and to having caused an explosion. Two of the lads admitted having stolen the cordite from a dump on the northern outskirts of the city. The Procurator Fiscal explained that the three lads were connected with what was claimed to be the junior branch of the Scottish Nationalist Party. In August last the words "Up Scotland; don't let I.C.I. rule you" were written outside the Blythswood Square offices, and on December 14 was printed "*Suas Alba*" (Up Scotland, in Gaelic). The agent for the accused said that in conversation with the youths he had been convinced that their action was in the nature of a political demonstration against the company, which they believed, in their own words, to be "strangling Scottish economic life."

Last week-end another explosion ocurred at the same premises. It is believed that five hand-grenades were thrown into the offices, whereby basement and ground-floor windows were shattered. Several youths are said to have been seen running away from the site. Six further arrests have since been made.

MERCURY THIEF SENTENCED

Allegations were made at Widnes Police Court last month against Edward Whitfield, an employee of the I.C.I. Central Laboratory, Widnes, to the effect that he had stolen from the Central Laboratory 645 lb. 4½ oz. of mercury, valued at £612 5s. Detectives had found that mercury to the amount specified had been sold to a firm in Manchester by a man giving the name of Carter and a Widnes address. Whitfield was arrested and accused of the offence. He voluntarily admitted that he had received over £500, and after formal evidence, he was remanded on bail.

As a result, on January 6, Whitfield appeared again before the Widnes magistrates. He pleaded guilty to extensive thefts of mercury and the magistrates imposed a sentence of six months' hard labour.

Cellulose Triacetate

New Method of Recovery

THE acetone-soluble type of cellulose acetate is the one most commonly used commercially, but cellulose triacetate has aroused considerable interest because of its high water-resistance. However, when cellulose triacetate is made by acetylating cellulose with a reaction mixture which is solvent for the product, the latter is usually horny and difficult to dissolve. Other methods of acetylation are more expensive. Now, according to British Patent 530,037, assigned to Kodak Ltd., London, by C. J. Malm of Rochester, N.Y., a soft, white, readily soluble cellulose triacetate can be recovered by slowly introducing the reaction mixture, in which it is dissolved, into aqueous acetic acid of 40-60 per cent. concentration and maintaining that concentration by addition of small amounts of water until the ester separates as a translucent gel; the gel is then removed from the reaction mixture and the precipitation of the ester completed by washing and so breaking the gel with hot water. The dried product is said to dissolve easily in methylene chloride, tetrachlorethane, chloroform, etc. Esters precipitated in this way are recommended for use in lacquers.

As an example, a mixture of 50 parts by weight of cellulose and 490 parts of glacial acetic acid, containing 3.5 parts of a mixed (3 : 1) phosphoric/sulphuric acid catalyst, is allowed to stand for 4 hours at 38° C., and is then cooled to about 15° C. and 150 parts of 85 per cent. acetic anhydride are strred in. The clear solution produced is then slowly introduced into an agitated bath of aqueous acetic acid, kept at 40-60 per cent. concentration throughout the precipitation by adding water. The ester forms a gel, which is separated from the bath and first washed with cold water until free from acid. It is then put in boiling water for 3-4 hours. After drying, *e.g.*, by a current of air at 150°-200° F., the product is a soft, white, non-horny material said to be readily soluble in appropriate solvents.—*Paint Technology*, October, 1943.

UNIQUE MEETING OF ROYAL SOCIETY

For the first time since its formation in 1662. the Royal Society has held a meeting outside Britain. This event occurred last week when the Indian Science Congress, meeting in New Delhi, resolved itself into a meeting of the Royal Society. Professor A. V. Hill, secretary of the Royal Society, who is at present advising the Government of British India on scientific matters, was present. Two recently elected F.R.S.'s—Dr. H J. Babha and Sir Shanti Swarup Bhatnagar—undertook the obligations of fellowship and signed their names on a sheet of parchment, which will be incorporated in the Society's membership book.

Among those who addressed the Congress was the Viceroy, Lord Wavell, who spoke of the necessity of enlisting the help of scientists to control the genii they had raised, and to bring order into this new world, for which the scientists were so largely responsible. He also mentioned the fact that his great grandfather was "quite a distinguished scientist," who discovered a mineral which Sir Humphry Davy named "wavellite." (Wavellite consists of hydrous aluminium phosphate and has the formula $4AlPO_4.2Al(OH)_3.9H_2O$. It was first observed in the eighteenth century by Dr. W. Wavell in the slates at Filleigh, near Barnstaple, Devon.

Scientific Films

New Association's Aims

AT the recent formal constitution of the Scientific Film Association, the following were elected to the council: Miss F. M. Anthony, B.Sc.; Mr. W. Ashurst, A.Inst.P., secretary of the Science Masters' Association; Mr. H. L. Beales; Mr. Geoffrey Bell; Mr. Oliver Bell, director of the British Film Institute; Mr. C. M. Boyle; Dr. Archibald Clow; Dr. George Dunlop; Mr. Arthur Elton (president); Mr. Sydney Gregory, B.Sc., M.I.Chem.E.; Dr. G. I. Hobday; Mr. George Jones, A.I.C., F.R.P.S. (hon. treas.); Miss Blodwyn Lloyd, Ph.D.; Mr. J. A. Lauwerys, Reader in Education, London University; Mr. W. McAdam Eccles, M.S., M.B., M.R.C.S.; Mr. M. Michaelis, B.Sc. (hon. sec.), Dr. Rathbone, A.I.C.; Mr. Paul Rotha; and Mr. Derek Stewart.

The aims of the new association are: (1) To promote the national and international use of the scientific film in order to achieve the widest possible understanding and appreciation of scientific method and outlook; (2) to collect, collate and distribute information on the scientific film; (3) to publish comprehensive lists of films graded according to scientific merit and suitability for audiences; (4) to establish relations with Government departments, public bodies and other organisations able to make, use or circulate scientific films; (5) to organise a representative panel of scientists to advise producers of films of all types on scientific matters in connection with such films and to maintain close contact with the film industry; (6) to promote the production and distribution of scientific films; (7) to encourage the setting up of scientific film societies; (8) on request, to select or book programmes of scientific films. All inquiries should be made to the hon. secretary, 51 Fitzjohn's Avenue, London, N.W.3.

U.S. War-Plant Safety

Some Significant Accidents

AN analysis of accidents in war production plants in the U.S.A. was presented to the recent 32nd National Safety Congress at Chicago on behalf of Capt. G. C. Whalen, of the Chemical Warfare Service, which is responsible for the safety of all plants manufacturing toxic or dangerous products for the armed forces. In addition to private plants, the C.W.S. runs four manufacturing arsenals, three of them constructed since the war began. The accident rates in these plants have been very high. In the first six months of 1943 the four arsenals had a frequency rate of 54.35, and a severity rate of 2.0. The service, though, has this under control at present, as it took six months to determine the cause of the accidents on which a safety programme could be based. The arsenals aimed to cut this rate 50 per cent. by the end of 1943, and at the time of writing the record was a frequency of 8.5 and a severity of 0.1.

A Mysterious Explosion

Captain Whalen's paper gave several specific examples of the hazards met. In one plant, mixing a compound used for screening troop movements, eight men were recently killed by a violent explosion. Before the disaster thousands of tons of the material had been mixed without an accident, and without the knowledge that the smoke was a potential killer. Only one change had been made in the whole processing method: the shipment was made in metal drums instead of the paper bags formerly used. Static electricity may have been the cause, but the fact that the materials have a high ignition point seems to preclude that possibility. That explosion is still a mystery, but experiments proved that one of the materials was releasing acetylene, owing to the presence of carbide as an impurity. This, combined with the known fact that the air-conditioning system was not working that day (a guard talked with one of the employees who had left the supposedly cooled building to cool off), has given the clues to the way the explosion occurred. Now, the material is being mixed in barricades and treated as an explosive. Air-conditioning caused another serious disaster in a similar plant. One of the mixers caught fire and the air system carried the dense smoke into an assembly room where some 35 persons were working. This room had four double safety exit doors, equipped with panic bolts, yet despite this two workers were smothered by the dense smoke and many sustained minor injuries. The smoke was extremely thick, as would be expected, and visibility was practically nil. This is proved by the fact that one woman worker smashed her way to safety through a window, when only 2 ft. from her was an open door that she could not see. To prevent the recurrence of this accident the service will either instal automatic smoke detectors that will vent all lines outdoors in cases of this sort, or the whole mixing operation will be done in separate cubicles.

Mishap in a Ball Mill

Another example cited concerned a manufacturer who had conducted grinding trials in a 10-lb. ball mill, and noted only a slight build-up pressure. With no further trials, the process was put into commercial production, using a 500-lb. ball mill; the whole section of the factory near the mill left its moorings, one death and five very serious injuries resulting.

Extraction of Tung Oil

Tests of Various Solvents

EVALUATION of a wide variety of commercial solvents for the extraction of tung oil is the subject of an article by three U.S. Department of Agriculture chemists, A. F. Freeman, F. C. Pack and R. S. McKinney, in *Ind. Eng. Chem.* (1943, 35, 11, p. 1156). Some thirty solvents, with boiling points ranging from 26°C. to 140°C., were tested. Under the conditions of testing the most satisfactory solvents proved to be petroleum naphthas in the hexane class, cyclohexane, benzene, a petroleum naphtha consisting essentially of *n*-heptane, methylcyclohexane, chloroform, isopropyl ether and ethyl acetate.

Nine halogenated solvents (such as carbon tetrachloride, ethylene dichloride and trichlorethylene) were tried; they yielded oils of borderline quality, but the authors recommend that these should be studied further, since their relatively high flash- and fire-points make them safe for commercial practice. Some difficulties have been experienced in the solvent extraction of drying oils with halogenated solvents, particularly in the decomposition of the solvent and consequent halogenation of the drying oils which impairs their commercial value. Recent developments, however, have indicated that one of these compounds, trichlorethylene, has been used successfully in the solvent extraction of soya-bean oil, and that, by using an inhibitor such as aniline, this decomposition was diminished to an extent where it was no longer a problem. The characteristics of the oil extracted by the various solvents are set out in convenient tabular form in the article.

Oil Quenching

A Possible Source of Fire Hazard

by L. G. WHYBROW PALETHORPE

MUCH attention has recently been given to some of the fire hazards in industry. The need for so doing is obvious, when one considers the possible effect on our war effort of fires caused by careless prevention arrangements. One source of danger which should be brought to light is that of fires which may be cause when quenching steels in oil in the course of their heat treatment. Normally, one does not expect to meet any particular hazard in this direction, but during time of war many firms are conducting heat-treatment operations for the first time. In addition, the quenching oils normally obtainable are not now available, and those which are supplied appear to be more inflammable than the whale oil that most of us were accustomed to use in better days. Thus, there is a real need for extra care with the oils, even if one is experienced in oil quenching generally.

Two other factors must be considered in relation to the inflammability of quenching oils, namely (a) the volume of oil in relation to the bulk of steel to be quenched and (*b*) the speed of the quenching operation.

(a) The volume-of-oil / bulk-of-steel ratio decides to what temperature the oil will be raised when a given weight of steel is quenched. If the volume of oil is relatively small, its inflammability will be increased accordingly, owing to the increase in its temperature, until further additions of hot steel set it on fire. As indicated above, the oils now supplied are more inflammable than hitherto, and will not, therefore, take the same weight of hot steel without intermediate cooling. In normal times the design of oil-quenching tanks is carefully worked out in relation to the type of work expected, but during the war many of us have undertaken work a little beyond our capacity in order to assist the national effort, and so plant generally has been overloaded.

(b) The speed of quenching often decides whether or not the oil will be set on fire. With slow quenching, oil is vaporised around the work and is ignited; the flames generally spread over the whole surface of the tank and are usually difficult to quench. When work is quenched rapidly the oil cannot ignite because the hot steel has submerged below the surface.

Safety Measures

Apart from the ordinary precautions—having a fire extinguisher handy, and keeping all inflammable materials well away from quenching tanks—there are three other measures which are worthy of note.

(1) To ensure rapid quenching, a hoist fitted with a quick-release mechanism will be very helpful. Apart from reducing the fire hazard, it will permit of more uniform quenching from the metallurgical point of view.

(2) To maintain the oil at a low temperature during working, thereby reducing the fire risk, a circulating and cooling system should be incorporated where possible. The simplest and most efficient method involves the circulation of the oil by means of a centrifugal pump through a cooler of the heat-exchanger type. Fig. 1 illustrates diagrammatically the necessary lay-out.

(3) To quench a fire on the surface of the oil in a tank, the standard types of fire extinguisher may be used, but a more effective device is a lid

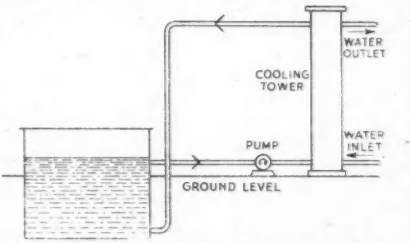

Fig. 1. Plan of circulating and cooling system for oil-quenching.

of the folding type. The writer had one fitted to an oil tank under his jurisdiction, and whenever the oil fired the lid was pulled over and the fire was damped, simply because the air needed to support the combustion was excluded.

Finally, users of cyanide-carburising equipment are compelled to employ a mineral oil for quenching, because vegetable and animal oils would gradually become thick by saponification. Generally speaking, the mineral oils are more inflammable than the vegetable and animal oils, and due regard to this point must be given by users, otherwise frequent ignition of the oil will result. Ignition of the oil in quenching operations is not usually dangerous if the above precautions have been taken. It is only when no precautionary measures have been put in hand, either to prevent ignitions or to quell them rapidly if they occur, that there is a real danger of fire.

A new blast furnace, with the largest capacity in the U.S.S.R., has been put into operation at Magnitorgorsk, the Ural iron-ore centre. This is the sixth furnace at the Magnitogorsk works, and the second to be opened since the war.

Chemical Research in Eire

Agar, Phosphates and Citric Acid

THE Eire Chamber of Deputies had before it at its December meeting two informative reports concerning scientific and industrial research. The first, the Industrial Research Council's Report for 1942-43, stated that the Council had advised the Government on a tentative scheme for the setting up by the Department of Industry and Commerce of a permanent institute for industrial research. It is expected that, when the opportunity arises, industrial research in Eire will be organised on a more permanent and autonomous basis. The report gave details about seaweed products; the chemical composition of seaweeds and their industrial potentialities have been investigated; these particular researches were initiated at University College, Galway, under the supervision of Professor Dillon. Particular attention is directed to the production of crude calcium alginate, which is expected to prove useful as a size for twines and other purposes.

In order to locate beds of seaweed suitable for the production of agar a complete survey has been made of the west coast under the direction of Miss Maurin de Valera, M.Sc., botanist (daughter of the Taoiseach). This has revealed beds of various useful species in Galway, Clare, Kerry, and Cork, and a process for the extraction of agar from them has been developed by Dr. Barry under the supervision of Professor Dillon. Production of agar-agar on a limited scale has been already started by one commercial firm, and very favourable reports on the suitability of this product for bacteriological work have been received.

Turf Research

Turf investigation, the report continues, is being energetically pursued in Eire. In the course of experiments, undertaken at the request of the Turf Controller, a considerable improvement was made in the efficiency of a heating boiler designed to burn coke. There is also a plan for improving a turf-fed range installed in a Dublin Corporation housing scheme. The Council is participating in various tests and trials in the use of turf in steam boiler plants in textile and other factories.

The Dail has also heard about the investigations of the Emergency Scientific Research Bureau into the possibility of producing a concentrated superphosphate without the use of sulphuric acid. Deputy Hughes raised this question, by referring to an article in the *New Zealand Journal of Agriculture* on serpentine phosphate and asking whether consideration had been given to the production in Eire of this type of superphosphate, having regard to the existence there of the raw material. Mr. de Valera declared that a concentrated phosphate was made in the United States by using phosphoric in place of sulphuric acid, and added that the Bureau was studying the question of operating such a process in Eire. The Bureau has not examined the possibility of manufacturing serpentine superphosphate: its effort has been directed mainly toward converting the insoluble phosphate from Clare phosphate rock to a citric-soluble form. The investigations included experiments, which showed that a product with a high degree of solubility could be obtained by treating ground Clare phosphate rock with sodium carbonate at a sufficiently high temperature. The whole matter of the most suitable type of phosphatic fertiliser is being actively pursued.

Citric Acid from Beet Molasses

In a paper by Mr. Oliver Roberts, M.Sc., and Dr. D. Murphy, M.Sc., Ph.D., delivered to the Royal Dublin Society, the shortage of citric acid in Eire was mentioned. Before the war some 150 tons per annum (valued at about £20,000) were imported. By fermenting Irish beet molasses, citric acid could now be produced in two days as against nine by the old method, which required large quantities of sugar and equipment that is no longer obtainable. For the new method only four raw materials are needed, and they are all produced at home. Thanks to this method Irish beet molasses could be fermented to yield citric acid and calcium gluconate simultaneously. Nearly 70 per cent. of the sugar present in the molasses could thus be converted into useful products, the fermentation taking place on a base of sphagnum moss impregnated with diluted molasses. The two products are readily separated.

RATES FOR A WORKSHOP

A King's Bench Divisional Court last month dismissed with costs an appeal by Messrs. James A. Jobling and Co., Ltd., of Wear Glass Works, Millfield, against a decision of the Sunderland Borough Assessment Committee that premises the firm occupied in Leopold Street, Sunderland, did not constitute an industrial hereditament for derating purposes.

Mr. Justice Atkinson, giving the judgment of the court, said the Leopold Street premises were used after 1940 when the main factory was found to be too small. But only a small portion of the glassware taken there from the main factory was subjected to finishing work. The place was used for keeping goods in orderly arrangement and packing them for distribution, and was not primarily occupied and used for any process forming part of the chain of manufacture. The decision of the Assessment Committee was, therefore, right.

New Control Orders

Polishes

THE Limitation of Supplies (Polishes) (No 4) Order, 1943 (S.R. & O. 1943, No. 1733), which supersedes the corresponding No. 3 Order, continues the control on the supply of polishes containing wax for a further period of six months—until June 30, 1944. The main changes are as follows:—

(1) Permitted polishes, that is, polishes for floors, furniture, footwear and leather have now been divided into two classes; (a) ancillary polishes, such as are commonly used in the manufacture or repair of leather or footwear and other leather goods, and (b) domestic polishes. Registered manufacturers may supply permitted polishes of either class to a value not exceeding 50 per cent. of their supplies of polishes of that class during the standard period, or a total value of £250 for *both* classes, whichever is the greater. The prohibition on the supply of all other kinds of controlled polishes remains in force.

(2) Persons from whom materials for the manufacture of polishes are ordered must obtain from their customers who are not registered manufacturers, a declaration that they are entitled to supply polishes of their own manufacture *before* any materials are supplied, but only one such declaration need be obtained from each purchaser. Materials for the manufacture of polishes may now also be sold to any person who has given a written declaration that he carried on a business of supplying such materials wholesale immediately before September 1, 1943.

(3) All declarations received and records kept for the purposes of this Order must be retained for at least 18 months.

Toilet Preparations

The Toilet Preparations (No. 4) Order, 1943 (S.R. & O. 1943, No. 1683), which amends the Toilet Preparations (No. 3) Order, 1943, came into force on January 1. Under the new Order the prohibition on the supply of hair preparations containing petroleum products, which would have come into force on March 1, 1944, has been removed. Registered manufacturers will now be permitted to make and supply these preparations under licence in the same way as other controlled goods; unregistered manufacturers who are entitled to supply controlled goods of their own manufacture to a value not exceeding £41 13s. 4d. per month may include hair preparations in these supplies.

Except under licence, unregistered manufacturers may only supply toilet preparations of their own manufacture by retail sale on the premises where the goods are made; or by using the preparations in the course of their business.

Calamine lotion N.W.F. is no longer controlled.

LETTER TO THE EDITOR

Nitriding

SIR,—We were very interested to see the article on "Nitriding" in the Metallurgical Section on your issue of January 1, p. 11 *et seq.*, but we should like to contest the mild impeachment in the paragraph on p. 14 relating to the question as to why nitriding, with its admitted advantages has not replaced the old process of case-hardening.

As holders of the patents for the nitriding process, we strongly refute the argument that we have retarded its development: on the contrary, we have been directly responsible for the enormous growth of nitriding in the most vital branches of engineering, of which the tale cannot be half told until after the war.

We have never sought to substitute nitriding for case-hardening but rather to extend the field of possibilities for case-hardening in directions where the old process was not suitable. Our alloy steels must obviously be dearer than the carbon C.H. steels and the choice of which parts are to be made in which steel is just the ordinary economic one of prime cost divided by results required and obtained.

Facilities for Working

As regards the assertion of your contributor that the nitriding process can only be carried out by a few licence-holders and that work must be sent away for nitriding, this is quite incorrect. We have a number of nitriding centres, as listed in our booklet, specifically instituted to deal with the nitriding work for third parties, whose total demands are too small to justify their putting in their own nitriding furnace, but we have also a large number of individual licensees who handle their own work only, at their own works. We have always encouraged any firm to put in its own nitriding plant, when economically justified, and our terms of licence have been readily accepted by well over 50 of the leading firms in the country as eminently reasonable. It is, obviously, impossible to publish information about these licensees, as this is a matter which concerns them solely.

We do claim that, by centralising and developing the nitriding process, we have made this invention a practical and important factor in the metallurgical world, in peace time and even more so in war time, and we look forward confidently to even bigger expansion in the days which will follow our victorious peace.—Yours faithfully,

NITRALLOY, LIMITED.,
R. W. ALLOTT,
Director.

January 7, 1944.

Personal Notes

MR. J. HAROLD THOMPSON, B.Sc., has succeeded Mr. John Dunlop as chief agricultural adviser to British Basic Slag, Ltd.

MR. H. C. F. MOCKRIDGE has been elected a director of the International Nickel Company of Canada in succession to the late Mr. Britton Osler.

DR. ROBERT C. HOCKETT, Associate Professor of Organic Chemistry at the Massachusetts Institute of Technology, has been appointed Director of the American Sugar Research Foundation.

MR. T. J. CAVANAGH has been appointed chairman of Barry, Ostlere and Shepherd, linoleum manufacturers, in succession to the late Mr. P. O. Byrne. MR. ERIC OSTLERE and MR. C. R. PARSONS are appointed joint managing directors along with the new chairman.

PROFESSOR H. V. A. BRISCOE, DR. H. D. K. DREW and DR. JANET H. MATTHEWS have been appointed representatives of the Institute of Chemistry on a sub-committee of the British Standards Institution, which is preparing specifications for scientific and laboratory glassware, and for the standardisation of microchemical apparatus.

New members of the Institution of Chemical Engineers include MR. BRIAN N. REAVELL, B.Sc., A.C.G.I., of the Kestner Evaporator & Engineering Co., Ltd.; MR. JOHN WALCZYNSKI, Polish Ministry of Industry, Commerce and Shipping; MR. E. EVANS-JONES, B.Sc., Petroleum Board; and MR. E. C. B. MADAIL, Cia. Uniao Fabril, Portugal.

SIR JOHN GIBB NICHOLSON, vice-chairman of Imperial Chemical Industries, Ltd., who received a knighthood in the New Year Honours, was born in 1879, and educated in Glasgow, leaving school at the age of 16 (1895) to go as an apprentice to James Black and Co., calico printers. In 1901 he was transferred to the head office of the Calico Printers' Association in Manchester shortly after the formation of this Association, and in 1909 he joined Brunner, Mond & Co., for whom he travelled extensively, particularly in the Far East and South America. He was responsible for the establishment of many of the companies that now form part of the overseas organisation of Imperial Chemical Industries, Ltd. When I.C.I. was formed in 1926 Sir John was one of the original directors; he was made deputy chairman in 1940.

Obituary

From Madrid is announced the death, at the age of 73, of DON VENTURA AGULLO DE LA ESCOSURA, Professor of General and Analytical Chemistry at the Madrid School of Industrial Engineering.

MR. ROBERT RODNEY LYONS, A.M.I. Chem.E., chief chemist and assistant works manager to the New Zealand Farmers' Fertiliser Co., Ltd., has died at Auckland, N.Z., aged 38.

DR. EMERICH GRANICHSTAEDTEN, D.Sc. (Vienna), who died in Edinburgh on January 5, was an Austrian chemist of international reputation in the oil industry field and especially on the subject of fat hardening, having published several books and papers and taken out many patents covering this branch of chemistry. His firm, the Centra Works at Krischwitz, Czechoslovakia, was taken over by the Unilever concern, with which he had kept in close association. His latest researches dealt with road surfaces.

As was briefly announced in our last week's issue, DR. FRANK LEE PYMAN, research director of Boots Pure Drug Co., Ltd., died on January 1 at Radcliffe-on-Trent, aged 61. He graduated at Manchester in 1902 with highest honours in chemistry

Dr. F. L. Pyman.

and was awarded the Mercer Scholarship and the Le Blanc Medal. Later he carried out research at Zurich under Bamberger, and was awarded the degree of Ph.D. (Basle) in 1904. Dr. Pyman soon became an outstanding personality in the realm of chemical research. Much of his work was in connection with the constitution and synthesis of the active constituents of natural products, notably various alkaloids, and his remarkable work in chemotherapy included research on organic arsenicals, substituted amino-alkyl esters, and acid amides. As a result of his numerous and important publications, he was awarded the degree of D.Sc. in 1910 by the University of Manchester and became F.R.S. in 1922.

After a short period at the Government Laboratory, in 1906 Dr. Pyman joined the staff of the Wellcome Chemical Research

Laboratories, where in 1914 he became director of research. From 1919 to 1927, at Manchester, he was Professor of Technological Chemistry in the University and Director of the Department of Applied Chemistry in the College of Technology, an appointment which he relinquished to become research director at the Nottingham laboratories of Boots Pure Drug Company.

For his outstanding contributions to chemotherapy, Dr. Pyman was awarded the Hanbury Medal of the Pharmaceutical Society in 1936. In 1937 he was president of the Chemical Section of the British Association, during its Nottingham meeting. He served on the council of the Royal Society in 1937-39, and the council of the Chemical Society in 1916-19 and 1924-27, and was vice-president of the Chemical Society in 1930-33. His Fellowship of the Royal Institute of Chemistry dates from 1919, and he was on the council of the Institute in 1924-27. He was a member of the council of the A.B.C.M. (in which he was chairman of the Fine Chemical Group in 1932-33), while during 1943 he was chairman of the research panel of the Therapeutic Research Corporation of Great Britain, Ltd.

General News—From Week to Week

Latest additions to the series of Fuel Efficiency Bulletins are No. 26: Peak Steam Demands—Cause, Effect, and Cure; and No. 27: The Control of Air Combustion.

The Council of the Royal Institute of Chemistry has approved the proposal that the Institute should become a corporate member of the Scientific Film Association.

"Chemistry and Cancer," the lecture delivered to the Royal Institute of Chemistry last November by Dr. J. W. Cook, F.R.S., has now been published as a pamphlet, price 2s. 6d.

The Pharmaceutical Society has accepted the offer made by Messrs. Allen and Hanburys, Ltd., of a research fellowship for the encouragement of pharmaceutical research.

The Eastern Chemical Company has received, through E. D. Sassoon & Co., an offer for the sale of its fixed assets and goodwill in India for R.16 lakhs (say, £120,000) plus stocks, which are estimated at about R.6½ lakhs (say, £48,750).

The British Colour Council's exhibition, with the title of "Colour in Everyday Life," will be open every day, including Saturdays and Sundays, until February 27. It is being held at the Royal Academy, Piccadilly, London, W.1.

Mainly as a result of improving steam trapping arrangements, raising the standard of lagging, and shortening and re-arranging pipe-lines, a Lancashire soap works is showing, on the steam plant, a fuel saving of 40 per cent. There are, in addition, useful gas and electricity economies.

There are no changes in the existing prices of oils and fats allocated to primary wholesalers and large trade users during the eight-week period January 9 to March 4, except that in the case of South American imported animal fats an allowance of £2 5s. per ton will be made if such fats are supplied in softwood barrels.

Reprints of a number of German chemical publications are being made in America by the photo-offset process, under the authority of the Alien Property Custodian. H. K. Lewis and Co., Ltd., 136 Gower Street, London, W.C.1, announce that they are prepared to accept orders for any of the titles on the list (which can be obtained from them), but are unable to guarantee delivery owing to the limited number of copies printed.

The amount of sulphur contained in Great Britain's annual coal output is about 2½ million tons, state Mr. G. M. Gill and Mr. John Roberts, D.I.C., in their paper delivered this week to a joint meeting of the chemical societies and the Institute of Fuel at Bristol. They consider that all our sulphuric acid needs could be met from this source of sulphur and pyrites, provided that all the hydrogen sulphide was recovered, as in current gasworks practice.

A vast expansion of technical education was predicted by Mr. J. Chuter Ede, Parliamentary Secretary to the Board of Education, when he spoke at South Shields last week. He said that originally the Government estimated that the cost of this expansion during the first seven years would be £2,450,000, but after consultation with industrialists, workers, and educational representatives it had been found necessary to multiply that sum by over fourteen times to £35,000,000.

An intensive course of lectures on chemical engineering will be given in Birmingham by Mr. E. Woollatt, B.Sc., A.M.I.Chem.E., if sufficient support is forthcoming. The course will be under the auspices of the local section of the Royal Institute of Chemistry, and will occupy three week-ends in April-June. The fee will be three guineas; applications should be made to the local secretary (E. M. Joiner, 15 Hatton Road, Sutton Coldfield) before January 31; those from Fellows and Associates of the Institute will be given priority.

Some quite definite reductions in atmospheric pollution have been observed by the D.S.I.R. investigators of the subject since the fuel economy campaign began in 1942. In the winter of 1942-3, for Great Britain as a whole, deposited matter diminished by about 5 per cent., and sulphur dioxide by about 11 per cent.

Ammonium nitrate prepared in the form of pellets, which are then treated with small quantities of kieselguhr and paraffin, does not exhibit the unsatisfactory caking quality of the ordinary material, states Mr. Charles J. Brand, of the National Fertiliser Association, in an article on fertilisers in war-time published in *Chem. Eng. News* (1943, *21*, p. 1788).

"**Research workers** have been so successful in their efforts to substitute synthetic rubber for natural that, early in the New Year, the whole output of the British rubber industry will consist of three-quarters synthetic to one-quarter of natural rubber." This statement of the current position has been published by the British Rubber Manufacturers' Association after thorough tests by its technical advisory committee.

Foreign News

The American Cyanamide & Chemical Corporation is building a million-dollar new plant in Tarrant County, Texas.

Many restrictions on consumers of graphite and carbon electrodes have been removed by the War Production Board of U.S.A.

Bakelite Corporation of Canada, Ltd., has transferred all its assets and business to its affiliated company, Carbide & Carbon Chemicals, Ltd.

The Chemical Warfare Service of the U.S. Army announces the use of white phosphorus hand-grenades in operations against the Japanese.

Through the Defense Plant Corporation, the U.S. Government has granted an expansion subsidy of $10,000,000 to the Electro Metallurgical Company, Ashtabula, Ohio.

Total world sales of Chilean nitrate for the year to June 30, 1943, were slightly lower, compared with the previous year, at 1,243,000 tons.

The Commonwealth Government is erecting a factory to treat whale oil as part of a plan to develop an Australian whaling industry.

The permanent fading of alkaline phenolphthalein solutions is explained by Max H. Hubacher in a contribution to the American Chemical Society's Journal (1943, *65*, 11, p. 2097). Degradation products resulting from air oxidation are phthalic acid and 2-(4'-hydroxybenzoyl)-benzoic acid. Oxidation by hydrogen peroxide yields hydroquinone in addition.

Rich oil deposits have been found in the Los Alamos region, in the Chilean province of Arauco. The Department of Mines and Fuel has ordered the sinking of a shaft 2400 ft. deep, says Reuter.

The Cuban Government has agreed to produce 800,000 short tons of invert molasses in 1944 for purchase at 2½ cents. per lb. by the Defense Supplies Corporation of the U.S.A. for production of industrial alcohol.

Large-scale use of synthetic vitamins in Germany is evidenced in the recent distribution for children of 264 million tablets of vitamin C and 544 million tablets of vitamin C and calcium.

A Stockholm newspaper reports that during the bombing of Ludwigshaven on December 20 a chemical factory making poison gas was hit and 300 workers suffered gas poisoning.

An Association of Scientific Workers has been established in South Africa. There are two branches, at Johannesburg and Cape Town, with a joint membership of over 350.

The last of 11 giant open-hearth furnaces at the new D.P.C.-financed works of the Carnegie-Illinois Steel Corporation, Pittsburgh, has been opened with an annual capacity of 1,500,000 tons of steel ingots.

A new Argentine Government department has been formed, with the title Dirección Nacional de la Energia, its function being to organise the nation's fuel resources. It will conduct investigations of new coal and oil fields and their exploitation.

Forthcoming Events

The Leicester section of the **Institution of the Rubber Industry** meets on **January 15,** at 3 p.m., in the College of Art and Technology The Newarke, Leicester, to hear a lecture by Mr. Leslie Rose, A.I.C., on viscose rayon.

At the meeting of the **Institute of Fuel,** on **January 19,** at 2.30 p.m., in the James Watt Memorial Institute, Birmingham, Mr. R. Whitfield will lecture on "Fuel and Metallurgical Furnaces."

Dr. H. W. Thompson will deliver the Tilden Lecture to the **Chemical Society,** Burlington House, Piccadilly, on **January 20,** at 2.30 p.m. His subject will be "The Scope and Limitations of Infra-Red Measurements in Chemistry."

The **Institute of Fuel** meets in the lecture theatre of the Institution of Mechanical Engineers, Storey's Gate, Westminster, at 2.30 p.m., on **January 20,** to hear a paper by Mr. John Roberts, D.I.C., on "Buying Coal—To-day and To-morrow."

Dr. A. E. M. G. Gillam will deliver a lecture on "Pyrethrum and Pyrethrins" to the meeting of the **Royal Institute of Chemistry,** to be held at 6.30 p.m., on **January 20,** at the Engineers' Club, Manchester.

The **Institute of Fuel** meeting in London, arranged for **January 20,** has been cancelled.

A paper by Dr. W. D. Scott, on "Raw Material Potential and Its Relation to the Trend of Synthetic Resin Development," will be delivered to the Midlands section of the **Society of Chemical Industry,** on **January 20,** at 5.30 p.m., at the Chamber of Commerce, Brimingham.

The Midlands sections of the **Society of Chemical Industry** and the **Institution of Mechanical Engineers** are holding a joint meeting on **January 20,** at 5 p.m., in the James Watt Memorial Institute, Great Charles Street, Birmingham, when two papers on plastics from the engineer's viewpoint will be delivered by Dr. S. L. Smith, superintendent of the National Physical Laboratory's engineering department, and Mr. J. L. Daniels, B.Sc., A.M.I.Mech.E.

The **Royal Institute** and the **Society of Chemical Industry** are holding a joint meeting at the North British Hotel, Edinburgh, on **January 21,** at 7.30 p.m., when Professor H. J. Gaddum will lecture on "The Fate of Drugs in the Body."

A meeting to inaugurate a new district section of the **Institute of Fuel** will be held on **January 21,** at 5.45 p.m., in the Royal Technical College, Glasgow, when the president, Dr. E. W. Smith, C.B.E., F.I.C., M.I.Chem.E., will give an address on "Education in the Fuel Industries," to be followed by a discussion. Professor A. M. Bryan, B.Sc., M.I.Min.E., J.P., will preside.

Professor E. D. Hughes will give a paper on "Chemical Reactivity" to the meeting of the **Chemical Society** arranged to take place at 3 p.m. on **January 22,** at University College, Swansea.

For the purpose of augmenting the Stalingrad Hospital Laboratory Fund the London Area Committee of the **Association of Scientific Workers** is organising a film show at the Cambridge Theatre, W.C.2, on **January 30, 1944,** at 6.30 p.m. The main feature of the programme will be "World of Plenty," which will be introduced by the director, Paul Rotha, to be followed by other scientific films. Tickets at 21s., 10s. 6d., 7s. 6d., 5s. and 2s. 6d. are obtainable from the A.Sc.W., London Area Committee, 59 New Oxford Street, W.C.1.

Company News

Dussek Bros. & Co., Ltd., record a profit of £77,268 (£80,848), for the year ended October 31. Final ordinary dividend is 8½ per cent., making 12½ per cent. (same).

British Industrial Plastics, Ltd., record a net profit for the year to September 30, of £21,659 (£21,424). Ordinary dividend, 8 per cent. (same); forward, £8168 (£6698).

British Coal Distillation, Ltd., reports a loss for 1942 of £6311 (loss £3915 for nineteen months), making a debit of £34,213 (£27,902).

London Manufacturing Chemists, Ltd., 9-11 Copthall Avenue, London, E.C.2, changed their name to Ephazone, Ltd., on December 7.

Zargo Company, Ltd., general merchants, Worcester House, Vintners Place, London, E.C.4, changed their name to Bridge Chemical Productions, Ltd., on December 22.

The Power-Gas Corporation, Ltd., reports a profit, to September 30 last, of £89,248 (£87,986). Distribution is unchanged at 12½ per cent. (dividend of 10 per cent. plus bonus of 2½ per cent.).

Imperial Chemical Industries have issued £84,898 of 7 per cent. cumulative preference shares in exchange for shares in Blacklock and Macarthur, paint and colour manufacturers, of Glasgow.

The Midland Bank, Ltd., reports a net profit, for 1943, of £1,984,396 (£1,997,132). A dividend of 8 per cent. for the half-year to December 31 is being paid, making 16 per cent. (same).

The Eastern Chemical Co., Ltd., announces a net profit of £4,026 (£3,524) for the year ended March 31, 1943, after allowing £35,900 (£16,000) as provision for taxation (U.K. and India).

Goodlass Wall and Lead Industries, Ltd., have acquired, as from January 1, Fry's Metal Foundries, Ltd., and that company's subsidiaries engaged in the manufacture of printing metal, solder, bearing metal, gunmetal, bronzes, etc. Fry's Diecastings, Ltd., is not included in the purchase. The Fry group's management will be unchanged, and the transaction involves no increase in the issued capital of Goodlass Wall.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DIXON PLASTICS, LTD., Earls Barton, manufacturers of plasters (M., 15/1/44).—December 13, £1000 debentures, to F. Dixon, Northampton; general charge. *£500. January 25, 1943.

Company Winding-up Voluntarily

SANDALL GROVE MINERALS, LTD. (C.W.U.V., 15/1/44.)—By special resolution. December 14. L. I. Ellis, of "Broughton House," 6, 7 and 8 Sackville Street, London, W.1, appointed as liquidator.

I.C.I. (DYESTUFFS), LTD. (C.W.U.V., 15/1/44.) By special resolution, December 31. T. W. M. Bland of I.C.I. (Dyestuffs), Ltd., Hexagon House, Blackley, Manchester, appointed as Liquidator.

Satisfaction

BRITISH CERAMICS AND CRYSTAL, LTD., Brierley Hill. (M.S., 13/1/44.) Satisfaction December 17 of debentures registered August 5, 1941, to the extent of £5,500 and unissued balance of £3,300 cancelled.

Declarations of Solvency Filed

RADIUM PREPARATIONS, LTD., London, W.C. (D.S.F., 13/1/44.) December 15.

Chemical and Allied Stocks and Shares

IN the absence of improvement of business in Stock Exchange markets, values tended to ease, and in many directions higher levels recorded in the past week were not held. There were, however, various gains in industrial shares on balance, but they were mostly moderate in character. Imperial Chemical were less firm than of late, and at one time on Friday of last week reacted to 37s. 9d. on the U.S. anti-trust suit, but following the chairman's statement rallied to 38s. 1½d. or within 10½d. of the level ruling a week ago. Buyers of I.C.I. ordinary were attracted by the yield shown on the basis of the 8 per cent. dividend which has ruled in recent years and by general expectations that this rate of dividend is likely to be maintained during the remaining period of the war.

Lever & Unilever held their recent rise to 36s. 3d.; sentiment in this case was assisted by the market view that after the war the dividend is likely to return to the 10 per cent. level. Turner & Newall, which remained under the influence of the full results, were well maintained on balance at 78s. 9d. Triplex Glass 10s. ordinary came in for attention, and compared with a week ago, have improved from 37s. 6d. to 39s. at the time of writing. This is another case where sentiment reflects hopes that after the war there may be scope for recovery in dividend payments, although as in most other instances it is realised that this may depend on many factors, particularly whether there is then an early reduction or abolition of E.P.T. Owing to the general disposition for Stock Exchange markets to attempt to discount the future a long way ahead, yields on many shares, based on current dividends, are now only moderate. British Oxygen ordinary, market views in connection with which were mentioned recently in these notes, further improved, and were 81s. 3d., compared with 79s. 6d. a week ago. British Aluminium were better at 47s. 9d., as were Borax Consolidated at 38s. Improvement in the shares of the last-named company was partly a reflection of the recent tendency for more attention to be given to shares of companies with assets and interests in the U.S.A. or Canada. Dunlop Rubber have been steady around 40s. Nairn & Greenwich further improved to 68s. 9d. (a rise of 1s. 3d.) on the financial results and the maintenance of the dividend at 12½ per cent. Barry & Staines at 44s. 9d. were within 3d. of the level current a week ago.

In other directions, Goodlass Wall 10s. ordinary moved up to 17s. following on the recent announcement of the new acquisition made by the company. Wall Paper Manufacturers deferred units at 39s. 6d. were little changed on balance, but elsewhere, International Paint eased to 110s., and Pinchin Johnson from 33s. 7½d. to 33s. 3d. Among plastics, British Industrial 2s. ordinary kept their rise to 6s. 9d., and Erinoid were again 10s. 6d. De La Rue rose to 162s. 6d. The units of the Distillers Co. were well maintained at 88s. 6d., as were British Plaster Board 5s. ordinary at 28s. 6d. Associated Cement strengthened to 63s. 6d. British Celanese, which recently attracted increased attention on hopes attaching to the company's new activities, were subject to profit-taking, and at the time of writing are 28s. 3d. Courtaulds were 52s. 9d., compared with 53s. 3d. Bradford Dyers eased to 22s. 1½d. General Refractories 10s. shares kept their improvement to 17s. 1½d.

B. Laporte were again 75s., and W. J. Bush 60s., while Greeff-Chemicals 5s. units remained at 7s. 3d. William Blythe 3s. ordinary were 9s., and Monsanto Chemicals 5½ per cent. preference 23s. 6d. Cellon 5s. ordinary kept at 23s., and Titanine 2s. ordinary at close on 7s. In the iron and steel section, Dorman Long held their improvement to 29s., while Stewarts & Lloyds rose to 53s. 1½d., and Tube Investments to 93s. 9d. In other directions, Boots Drug strengthened to 41s. 9d. Among oil shares, "Shell" and Burmah Oil have a firm appearance at the time of writing.

British Chemical Prices

Market Reports

A FIRM tone characterises most sections of the London general chemicals market. Requirements of the chief consumer industries for the first half of the year are

pretty well booked and there is no easing in the pressure for deliveries. New bookings during the past week have been of small dimensions, and influenced to a large extent by the scarcity of spot supplies. Export inquiry has been fairly good and a steady expansion in bookings for overseas markets is not unlooked for. Activity in the soda products and potash products sections continues steady on a firm price basis. Available supplies of the acid products are finding a ready outlet on a brisk demand and the position generally in this section remains strong. In other directions there has been a good market for barium compounds, lead oxides, and formaldehyde. With the distribution of most of the coal-tar products under control, the market has a very steady appearance and movements generally are in fulfilment of contract commitments. The demand for pitch is reported to be fairly brisk and there is a persistent call for supplies of creosote oil and crude carbolic acid. The export of tar acids to the U.S.A. under the scheme organised by the trade is proceeding along satisfactory lines, and fairly substantial quantities have already been shipped.

MANCHESTER.—Values generally on the Manchester chemical market during the past week have continued on a very firm basis and though there has been little in the way of actual upward movement, there has certainly been no indication of easiness in any direction. Moderate new bookings have been reported and steady deliveries are being made of most of the alkali products, as well as the ammonia and magnesia compounds and the acids, while potash chemicals are being taken up to the full extent of the relatively limited offers. In the tar products section a steady contract movement of supplies of most of the light and heavy materials is reported.

GLASGOW.—Business in the Scottish heavy chemical trade has been rather quieter during the past week for home business on account of the annual holiday. Export trade still remains very restricted Prices keep firm with a tendency to rise.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

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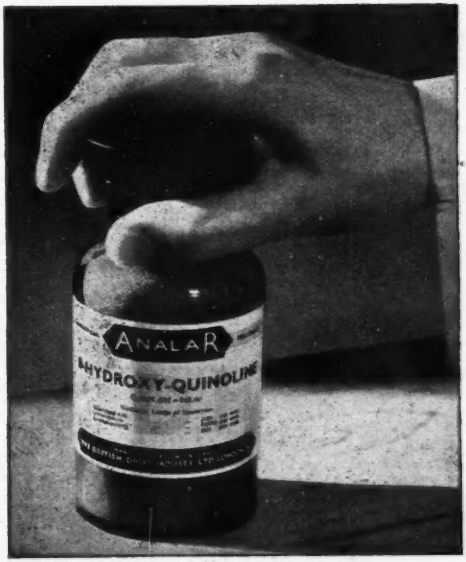

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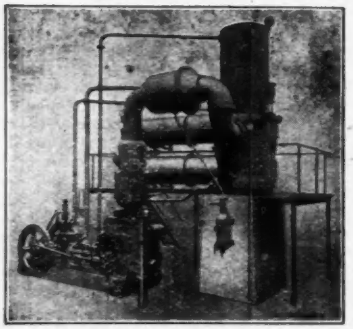

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Werner Pfleiderer tilting unjacketed MIXER, by J. Baker; pan 3 ft. 2 in. by 2 ft. 2 in. by 3 ft. 0 in. deep; fitted double "Z" blades, arranged for independent or simultaneous rotation; driven through gearing from belt pulley; reversing mechanism; power or hand tilting.

Horizontal unjacketed tilting MIXER by Werner Pfleiderer; pan 2 ft. 9 in. by 2 ft. 7 in. by 2 ft. 7 in. deep; arranged with double "Z" blades; driven through gearing from f. & l. pulleys; mechanical tilting mechanism and reversing gear.

Horizontal unjacketed tilting MIXER, by Werner Pfleiderer; pan 2 ft. 4 in. by 2 ft. 4 in. by 1 ft. 10 in. deep; arranged with double "Z" blades; driven through spur gearing from belt pulleys; mechanical tilting mechanism.

Horizontal tilting MIXER, by Morton; nickel-lined pan 1 ft. 8 in. by 1 ft. 8½ in. by 1 ft. 6½ in. deep; arranged with twin "Z" blades; driven through gearing from belt pulley, clutch incorporated; two speed gearing; mechanically operated tilting mechanism.

Horizontal unjacketed tilting MILD STEEL MIXER, by Werner Pfleiderer; pan 1 ft. 6 in. by 1 ft. 4 in. by 1 ft. 3 in. deep; fitted double "Z" blades; driven through gearing from f. & l. pulleys; arranged with reversing mechanism; two speed gear; hand-operated tilting mechanism.

Horizontal unjacketed MILD STEEL MIXER, by Werner Pfleiderer; pan 1 ft. 5 in. by 9½ in. by 1 ft. 3 in. deep; fitted singe "Z" blade; driven from f & l. pulleys; hand-operated tilting mechanism.

Horizontal tilting unjacketed MILD STEEL MIXER, by Hodgkinson; pan 1 ft. 2 in. by 1 ft. 2 in. by 1 ft. 7 in. deep; fitted twin sigma blades; driven through gearing from f. & l. pulleys; hand-operated tilting mechanism.

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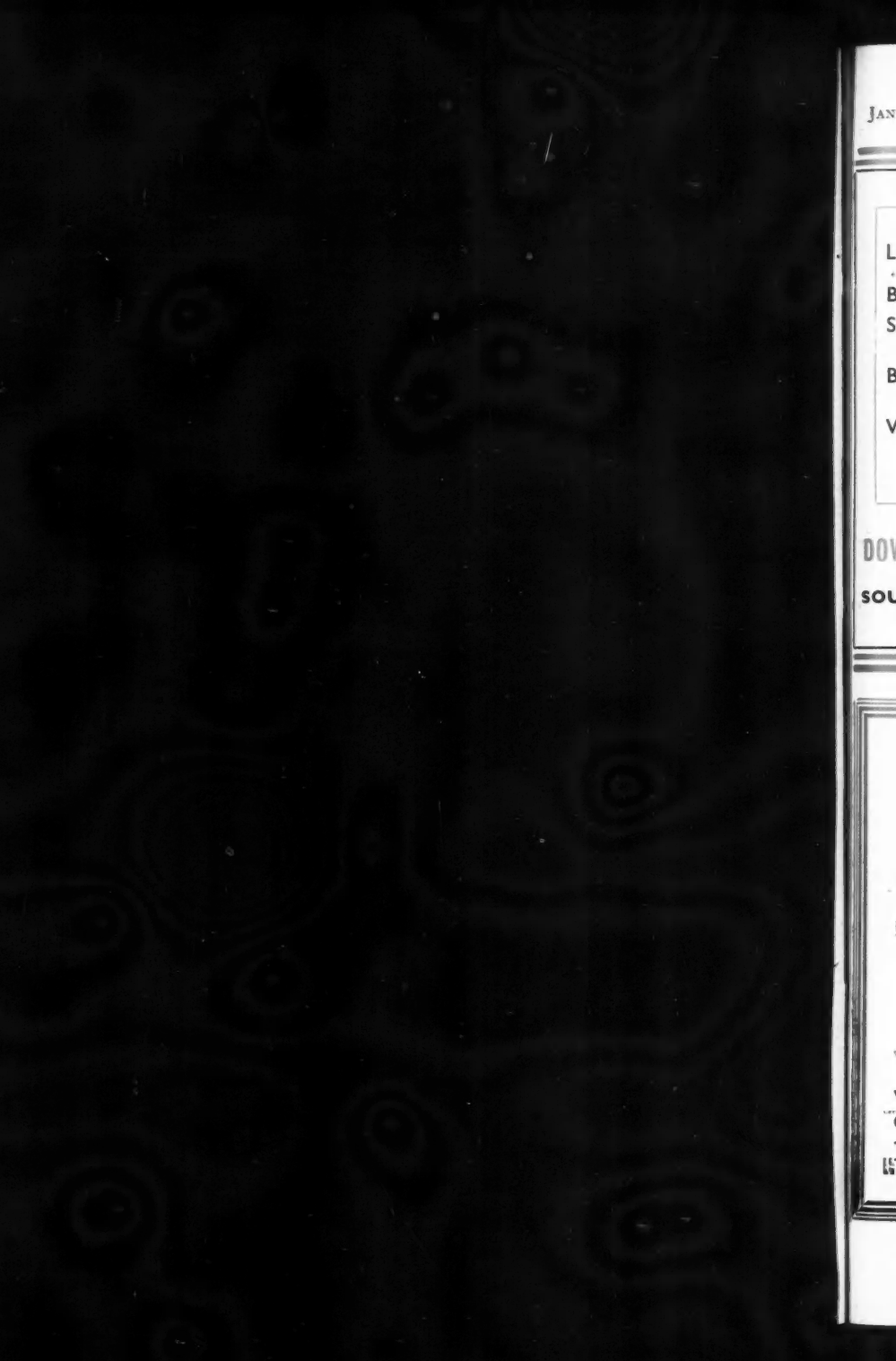

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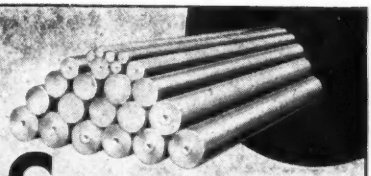

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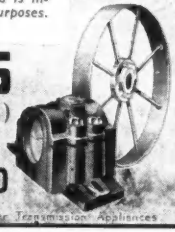

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Printed in Great Britain by THE PRESS AT COOMBELANDS, London and Addlestone, and published by BENN BROTHERS, LTD., at Bouverie House, 154, Fleet Street, E.C.4., January 15th, 1944. Entered as Second Class Matter at the New York, U.S.A., Post Office.